

Application No. 10/078,473
Reply to Office Action mailed December 8, 2005

- AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. **(Previously Presented)** A method of fabricating a tunnel junction of a vertical cavity surface emitting laser (VCSEL), comprising:
 locating a substrate in an MOCVD chamber;
 setting a temperature of the MOCVD chamber between 500 °C and 650 °C; and
 growing a tunnel junction including $\text{GaAs}_{(1-x)}\text{Sb}_x$ on the substrate using an MOCVD process in which a source of Ga, a source of Sb, and a source of As are present.
2. **(Original)** The method according to claim 1, wherein x has a value corresponding to a ratio of As to Sb.
3. **(Original)** The method according to claim 2, wherein the value of x is 0.5.
4. **(Original)** The method according to claim 2, wherein the value of x is less than 0.5.
5. **(Original)** The method according to claim 1, wherein the source of Ga is TMGa or TEGa, and the source of Sb is TMSb.
6. **(Original)** The method according to claim 1, wherein the source of As is AsH_3 or TBAs.
7. **(Original)** The method according to claim 1, further including carbon doping the $\text{GaAs}_{(1-x)}\text{Sb}_x$ using CCl_4 or CBr_4 .
8. **(Currently Amended)** A tunnel junction having a p-doped $\text{GaAs}_{(1-x)}\text{Sb}_x$ layer, and wherein the tunnel junction is less than about 10 nanometers thick.

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9. (Previously Presented) The tunnel junction according to claim 8, wherein the p-doped $\text{GaAs}_{(1-x)}\text{Sb}_x$ layer is doped with carbon with a concentration greater than $1 \times 10^{19} \text{ cm}^{-3}$.

10. (Previously Presented) The tunnel junction according to claim 9, further including an n-doped layer of InP, AlInAs, AlInGaAs, or InGaAsP.

11. (Currently Amended) The tunnel junction according to claim 10, wherein the n-doped layer is doped with a concentration greater than $5 \times 10^{19} \text{ cm}^{-3}$, wherein the $\text{GaAs}_{(1-x)}\text{Sb}_x$ layer is doped with a concentration greater than $5 \times 10^{19} \text{ cm}^{-3}$, ~~and wherein the tunnel junction is less than about 10 nanometers thick.~~

12. (Previously Presented) The tunnel junction according to claim 10, wherein the n-doped layer is InP, and wherein x has a value of 0.5.

13. (Original) A vertical cavity surface emitting laser, comprising:
an active region having a plurality of quantum wells, and
a tunnel junction over said active region, wherein said tunnel junction includes a $\text{GaAs}_{(1-x)}\text{Sb}_x$ layer.

14. (Previously Presented) The vertical cavity surface emitting laser according to claim 13, further including an n-type bottom spacer adjacent the active region, and an n-type bottom DBR adjacent the n-type bottom spacer.

15. (Previously Presented) The vertical cavity surface emitting laser according to claim 13, further including an n-type top spacer adjacent the tunnel junction and an n-type top DBR adjacent the n-type top spacer.

16. (Previously Presented) The vertical cavity surface emitting laser according to claim 13, wherein the $\text{GaAs}_{(1-x)}\text{Sb}_x$ layer is grown by MOCVD.

17. (Previously Presented) The vertical cavity surface emitting laser according to claim 13, wherein the $\text{GaAs}_{(1-x)}\text{Sb}_x$ layer is doped with carbon with a concentration greater than $5 \times 10^{19} \text{ cm}^{-3}$.

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18. **(Previously Presented)** The vertical cavity surface emitting laser according to claim 13, wherein said active region includes InGaAsP or AlInGaAs.

19. **(Previously Presented)** The vertical cavity surface emitting laser according to claim 18, wherein said tunnel junction includes an n-type InP layer.

20. **(Previously Presented)** The vertical cavity surface emitting laser according to claim 13, wherein x is 0.5.

21. **(Previously Presented)** The vertical cavity surface emitting laser according to claim 13, wherein the tunnel junction has a thickness of less than about 10 nm.